U.S. Serial No. 09/548,026

36140-902120

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PATENT & TRADEMARK

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

IN RE THE APPLICATION OF

Steen M. Matzen

SERIAL NO.: 09/548,026

FILED: April 12, 2000

FOR: Method For Testing An Electromagnetic Flowmeter, And An Electromagnetic Flowmeter Arrangement

Examiner: Edward Lefkowitz

Group Art Unit No.: 2855

Customer number: 23644

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Name of person signing: Jennifer J. Ramirez

Signature:

BRIEF ON APPEAL

This appeal is from the Examiner's final rejection of July 1, 2003, in which all pending claims were rejected. A timely Notice of Appeal was filed on October 1, 2003, with the required fee of $330.00.

This brief is being filed in triplicate, along with the current required $330.00 fee pursuant to 37 C. F. R. § 1.17(c). Since this brief is being filed during the third month following the Notice of Appeal, an appropriate petition for a one-month extension of time is also submitted herewith. Any additional fees should be deducted from, or credit applied to, Deposit Account No. 120913.

(1) REAL PARTY IN INTEREST

This application is assigned to Siemens Flow Instruments A/S of Nordborg, Denmark, who is the real party in interest.

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(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences that will directly affect or directly be affected by or have any bearing on the decision of the present appeal.

(3) STATUS OF CLAIMS

The application was filed on claims 18-35 replacing claims 1-17 of the International Application. Subsequently, during prosecution of the application, claim 32 was cancelled. Claims 18-31 and 33-35 remain rejected and are the claims appealed.

(4) STATUS OF AMENDMENTS

No response to the July 1, 2003 final Office Action was filed with the Patent and Trademark Office. Claims 18-31 and 33-35, in their current forms, are set forth in the Appendix.

(5) SUMMARY OF INVENTION

The present application relates to a method for testing an electromagnetic flowmeter which has a measuring tube and a coil arrangement for generating a magnetic field perpendicular to the direction of flow through the measuring tube. During operation, the current direction in the coil arrangement is periodically changed. The method of testing comprises the steps of sensing the change in the current direction and then determining at least one parameter of the current rise resulting from the current change. Next, the method of

testing compares the parameter with a reference value determined before the change in current direction. A variance in the parameter indicates that the flowmeter is malfunctioning.

The present application also relates to an electromagnetic flowmeter arrangement comprising a measuring tube and a coil arrangement which generates a magnetic field substantially perpendicular to the direction of flow through the measuring tube. The arrangement further includes an electrode arrangement substantially perpendicular to the direction of flow and to the magnetic field along with a supply system for the coil arrangement which has a current direction change-over arrangement. Additionally, the arrangement comprises a testing device which includes means which, after a change over of the current direction, determines at least one parameter of the rise in the current in the coil arrangement and compares the parameter with a given value determined before the change over of the current direction.

(6) ISSUES

One issue is presented for consideration by this Board. It is rejection of all of the claims under 35 U.S.C. §103(a) as being allegedly unpatentable over Gaertner (U.S. Patent No. 4,784,000) in view of Shauger, et al. (U.S. Patent No. 4,167,871).

(7) GROUPING OF CLAIMS

For the purposes of this appeal, claims 18-27 can be considered as a first group with independent claim 18 being the independent claim being represented of the group. While the dependent claims introduce many elements not even remotely suggested by the prior art, to reduce the issues to a main issue, only claim 18 will be argued. For the purposes of this

appeal, claims 28-31 and 33-35 can be considered as a second group, with independent claim 28 being the only independent claim being represented of the group. While the dependent claims introduce many elements not even remotely suggested by the prior art, to reduce the issues to a main issue, only claim 28 will be argued.

(8) ARGUMENT

The present application includes a coil arrangement which generates a magnetic field perpendicular to the flow direction through a measuring tube to produce a current within the measuring tube. After a changeover in the current direction, a rise in current occurs wherein the current rise is indicative of the flowmeter functionality (See specification page 2, lines 8-9). When the flowmeter functions properly, i.e., free from defects, the rise characteristics of the current are substantially identical to other functional current changeovers. When an electrical or magnetic defect occurs, the rise characteristic changes indicating that the flowmeter is supplying inaccurate measurements (See specification page 2, lines 10-12). The present invention provides a method for testing and a testing device which detect a variation in the current rise. The present application performs an analysis of the electrical properties and magnetic properties of the coil and compares the analysis to a given reference value.

In the present application, the at least one parameter can be a variable time rise of the coil current. The time period that elapses between changeover of the current direction and reaching a predetermined current value can be used as a parameter (see specification page 3, lines 5-6). After the current direction change, the coil needs a certain time until reaching the predetermined reference value. This current rise is a "fingerprint" of the system holding information about the electrical and magnetic properties of the flowmeter (see specification

page 2, lines 8-9). The reference value retains information about the rise time property of the coil. Accordingly, the reference value is determined before the current change. Thus, the present application measures a parameter of the current rise in the coil arrangement to detect any variance which provides information about the flowmeter behavior.

Therefore, the present application relates to a method for testing an electromagnetic flowmeter and electromagnetic flowmeter arrangement having a testing device, wherein the present application determines, after a current direction change, at least one parameter of the rise in current. After determining the at least one parameter, the present application compares the parameter with the reference value which is determined before the current direction change over. Determining the parameter of the current rise provides information about the flowmeter behavior. Thus, the present application indicates a test analysis to the user whether the flowmeter is functioning properly.

In contrast, *Gaertner* teaches a flowmeter circuitry for applying a first high voltage across the electromagnetic coils for a controlled length of time to build the current to a desired level. The circuitry then applies a second low voltage across the electromagnetic coils after the high voltage to maintain the coil current at the desired level (see column 2, lines 34-39). In *Gaertner*, the coil current is sampled at predetermined times during the low voltage application to adjust the high voltage application time to maintain the constant current.

In *Gaertner*, the circuitry controls the current level to compensate for variations such as cable length. Accordingly, the circuitry determines whether or not the current is or is not constant and "in response varies the amount of time the relatively high voltage is applied to the coils in order to make the sampled current relatively constant" (see column 7, lines 1-5).

Gaertner does not constitute a method of testing and a testing device for coil behavior, as taught by the present application. The entire circuit of Fig. 3 of *Gaertner* is a control circuit whose purpose is to keep the coil current constant (see column 6, line 64 through column 7, line 5) wherein a constant amplitude current is created through the coil during the measuring period of the flowmeter. As *Gaertner* explains, the constant amplitude is created by measuring the coil current at two instances within the same time period, and then comparing the amplitudes of the two currents. If those amplitudes differ, *Gaertner* then shortens or enlarges the duration of the high-voltage period shown in Fig. 4. Thus, *Gaertner* can compensate for voltage changes, such as reduced voltages caused by long cables.

In the present application, in distinction, the aim is not to keep the coil current constant. The present application already has a current regulator 18, 34 (see Figs. 1 and 2 of the present application), whose task is to create a constant current through the coil (see page 6, line 22 and page 8, line 6). In the present application, after a change in the current direction, a test of coil behavior is made and compared to a reference value to detect a variance.

The Examiner contends that column 4, lines 12-14 of *Gaertner* teaches that since sampling in *Gaertner* is done at different times, there is a reference value that is determined at an earlier time. That is nonsense. This reference value of *Gaertner* is simply a bare circuit amplitude and does not contain any information about the magnetic behavior of the coil. In the invention of the present application, in distinction, the reference value retains information about the property of the coil, e.g., the rise time. This is a "fingerprint" of the system holding information about the electrical and magnetic properties of the flowmeter as previously discussed.

The Examiner further contends that column 9, lines 3-45 of *Gaertner* teaches "a checking unit which checks to see if the time ascertained differs by more than a predetermined difference from a given value." Again, the Examiner is in error. The referenced section of *Gaertner* refers to times at which consecutive samples of the current "at a constant value" are taken. This section does not refer to, and has no relation to, a variable rise time of the coil current that is tested by the present application.

Gaertner does not make any determination about any change in the coil itself. In other words, *Gaertner* cannot determine whether the magnetic behavior of the coil is the same as when the coil was manufactured. *Gaertner's* method cannot provide any information about the dynamic magnetic behavior of the coil.

The present invention determines "at least one parameter of the current rise" (claim 18) or "at least one parameter of the rise in the current in the coil arrangement" (claim 28). In *Gaertner*, however, measured only are the amplitudes, and not any parameters of the current rise. As one skilled in the art will appreciate, detecting the current rise behavior provides information about changed self-inductance, and therefore changed magnetic behavior.

The *Shauger, et al.* reference is a non-relevant reference. It does not deal with testing, i.e., it solves another problem of measuring fluid flow rate. It does not deal with determining a current or a current rise, nor does it teach a comparison between a current rise parameter before and after a current reversal. In fact, the information in the rise period of the current, which is important in the present application, is fully skipped and not used in the curves of Figs. 2C and 2D of *Shauger*. The Examiner apparently has cited *Shauger* because of the comparator 40 in Fig. 1.

In this case, the problem identified by the prior art is directed to a different problem from that identified by the present application. In addition, the prior art solution identified for the prior art problem is different than the solution provided here. Accordingly, where the problems and solutions are different, this is strong evidence of non-obviousness because the ordinary artisan when confronted with the instant problem would not look to the prior art for a solution because that solution is different and deals with a different problem.

Gaertner and the present application solve two different problems and use two different solutions. *Gaertner* solves a control problem, but, contrary to the claimed invention of the present application, is not interested in testing the coil to see if it has changed over time. In the present application, the intent is to tell the user of the flowmeter whether or not the meter is still working in a trustworthy fashion. Nothing of that nature is suggested by *Gaertner*. A person skilled in the art would not be motivated to seek out the *Gaertner* or *Shauger* references or alleged modifications thereof, since the references relate to different problems than the present application. The *Gaertner* problem of constant current is solved by the current regulator 18, 34 of the present application. Thus, the skilled artisan would not be motivated to seek out *Gaertner* to test a variance of a current rise parameter.

Furthermore, even if the teachings of *Gaertner* and *Shauger* could, in some unclear manner, be combined, the failings of *Gaertner* outlined above would not be solved. Therefore, the claims are allowable even if the combination, which is not taught, suggested or implied by either reference or the art as a whole, were made.

It is submitted that *Gaertner* has been clearly distinguished, and *Shauger* is an inappropriate reference, and the claims remain allowable over the prior art. Reversal of the Examiner is therefore in order.

January 2, 2004

Respectfully submitted,

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APPENDIX

18. A method for testing an electromagnetic flowmeter having a measuring tube and a coil arrangement for generating a magnetic field perpendicular to the direction of flow through the measuring tube, the current direction in the coil arrangement being periodically changed, comprising the steps of sensing the change in the current direction, and after the change in the current direction determining at least one parameter of the current rise and comparing the parameter with a reference value determined before the change in current direction.

19. A method according to claim 18, in which testing is carried out during measurement of a throughflow.

20. A method according to claim 18, in which the reference value is determined from the flowmeter at an earlier time.

21. A method according to claim 18, in which a time period that elapses between two predetermined current values is used as the parameter.

22. A method according to claim 18, in which a time period that elapses between change in the current direction and reaching a predetermined current value is used as the parameter.

23. A method according to claim 18, in which after change in the current direction, a stepped-up voltage is used.

24. A method according to claim 18, in which the supply voltage of the coil arrangement is regulated ratiometrically in relation to a reference voltage which is also used to determine the parameter.

25. A method according to claim 18, in which the curve shape of the current rise is used as the parameter.

26. A method according to claim 25, in which the curve shape is formed by current values ascertained at predetermined times.

27. A method according to claim 18, in which current rises following directly one after the other are compared with one another.

28. An electromagnetic flowmeter arrangement comprising a measuring tube, a coil arrangement for generating a magnetic field substantially perpendicular to the direction of flow through the measuring tube, an electrode arrangement substantially perpendicular to the direction of flow and to the magnetic field, a supply system for the coil arrangement which has a current direction change-over arrangement, and a testing device, the testing device including means which, after a change over of the current direction, determines at

least one parameter of the rise in the current in the coil arrangement and compares the parameter with a given value determined before the change over of the current direction.

29. An arrangement according to claim 28, in which the testing device comprises a time-counter and a rise time serves as the parameter.

30. An arrangement according to claim 29, in which the testing device further comprises a comparator which compares the current or a variable derived therefrom with a given value and which is connected to the time-counter.

31. An arrangement according to claim 29, in which the time-counter is connected to a checking unit which produces an error message whenever the time ascertained differs by more than a predetermined difference from a given value.

33. An arrangement according to claim 28, in which an electrical resistance is arranged in series with the coil arrangement, the resistance having a temperature-dependent resistance behavior which is inversely proportional to that of the coil arrangement.

34. An arrangement according to claim 28, including a supplementary voltage supply system connected to the supply system by means of a change-over switch.

35. An arrangement according to claim 28, comprising an analogue-to-digital converter, which determines the analogue values in relation to a reference voltage, the value of which is also used as a starting point for determining coil current and coil supply voltage.